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CORRELATION OF ELEMENTARY SCHOOLS AND HIGH SCHOOLS

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Many superintendents of city schools would be glad to make a close study of the correlation of their elementary and secondary schools if they knew some simple, economic way of recording and tabulating results. Without any recognized method of procedure it seems like a hopeless task to most of them to undertake to evaluate the educational product of each of their various elementary schools through the high school.

The method to be outlined in this article is the outgrowth of a study of the correlation of the Milwaukee public schools. The study was rendered possible by the co-operation of Superintendent Pearse who made the wealth of well-preserved records in that city accessible to the investigator. There were naturally difficulties in organizing the material of such a scope into a simple, compact form. Undoubtedly the plans of tabulation and method of procedure which proved, after more or less experimentation, to be the best suited to such a problem may constitute a suggestive working basis for similar studies in other systems.

The study in question proposed to judge the preparation of pupils from each elementary school upon the basis of the ability exhibited by its pupils to retain their rank or relative position in the high school. That is, if a pupil has taken high rank in the elementary school, does he continue in the highest rank in the high-school class to which he is promoted?

The use of rank instead of absolute marks as the basis of all comparisons is very important for two reasons. In the first place, the group of pupils who never enter high school ought to be considered. If the pupils who go to high school from any given elementary school are not truly representative—that is, about equally divided between poor, average, and superior pupils—this

fact will be taken into consideration in the investigation by using the marks of all the original eighth grade to determine rank in that school. What is the wisdom in comparing two schools on the basis of the future marks of their pupils in high school if one-half of the pupils from one school were originally in the lowest division of the class and only one-tenth of the pupils from the other school came from the lowest division of the class? This difference in representation existed in two schools in Milwaukee and the difference in many cases was quite marked. Some schools did not have any of their poorest pupils going on to high school and, on the other hand, several schools had as many go from the low as from the high third of their classes.

The second important reason for the use of rank is found in the lack of uniformity of marking. The teacher whose pupils received the lowest marks in arithmetic (only one-third of the class got a mark above 78 per cent) must have marked very low, for the ability of her pupils was shown by an excellent record in mathematics in high school. More detailed illustrations of the lack of uniformity of standard will be given later. There is sufficient evidence to convince one that absolute marks may easily be misinterpreted by the high-school teacher if he attempts to gain any idea of the ability of pupils from different schools by the absolute marks used by different teachers.

ELEMENTARY-SCHOOL GRADES AND RANK

Elementary-school marks were taken from thirty-nine schools. In order to make this a comparative study, the entire outgoing class of a given year was taken as the basis for the study. There can be no doubt but that all of these pupils had pursued the same course of study in the elementary school and would have the same texts and subject-matter in high school. A class that graduated from the eighth grade in June, 1907, was selected, so that the progress of those entering high school could be followed for a considerable time. There were report sheets showing the marks, in a numerical percentage system of each pupil in all of his subjects.

(The scope of this article precludes a detailed description of the system of records as kept in Milwaukee and the minor details of technique in arranging this material.)

The marks in reading, arithmetic, language, and German were selected as typical. In each of the subjects the pupils were arranged in the order of superiority as indicated by the teacher's marks. Lines were then drawn marking off the third of the class having the highest marks, the third having medium marks, and the third having the lowest.

The special method used in tabulating these data is illustrated by the distributions of arithmetic marks for three schools in Table I.

TABLE I

				70	71	72	73	74	75	76	77	78	79	80	81	82
School 16 {	/		/	/						/	/	/	/	/	/	/
		/														
School 14 {		/	/		/	/	/	/	/							
	/		/		/	/	/	/	/							
School 7 {		/	/	/							/					/
			/													/
																/
																/
																/

TABLE I.—Continued

	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	Totals
School 16 {	/	/			/	/		/	/		/						= 24
																	= 49
																	73
School 14 {			/		/	/											= 21
																	= 22
																	43
School 7 {	/	/	/			/		/									= 13
	/																= 20
																	33

Every numerical percentage from 70 to 100 has a separate vertical column. There are also four groupings for lower marks. The record for each school is placed on a double horizontal column. The lists had been previously checked to show which pupils entered high school in the following autumn. These pupils were differentiated from the others by placing their record on the lower half of the column. It is a simple matter to take a list of final marks

for a class in a given subject and represent the mark of each pupil by a tally in the column designated by that per cent and, at the same time, keep the records of the high school and non-high school separate.

This form of tabulation serves several purposes: (1) With all the data on one sheet, totals can easily be obtained showing the distribution of marks for the entire city. And the total can be obtained either for those who went to high schools or for those who did not, as well as for the entire class. (2) It affords an excellent opportunity to compare in a graphic way characteristic features such as (*a*) a preponderance of marks in the upper or lower range of the scale; (*b*) a wide or narrow range of marks given; (*c*) an unusual use of certain marks, and (*d*) the difference between the marks of those entering high school and those who did not. (3) An intensive study can be made of each school. The plan facilitates the work of determining the rank of each pupil.

The entire class of each school is divided into three groups or tertiles, as nearly equal as possible on the basis of position in the scale of marks. For instance, if we establish three divisions or tertiles to determine high, middle, and low rank in arithmetic in School 14 (see Table I) there will be fourteen pupils in each tertile, with an extra one in the middle group. Heavy vertical lines are used to designate the limits of the tertiles. After the middle range—the inclusive percentages of the middle tertile—is known, the rank of each pupil may be set down opposite his name.

The example given in Table I also shows the impossibility of dependence on absolute marks. Pupils receiving a mark of 80 to 81 per cent in School 14¹ would be in the highest tertile (first mark); the pupils getting these marks in School 16 would be in the middle tertile, and the same marks would place pupils of School 7 in the lowest tertile. "Yes," someone may say, "That may not show that standards of marking were different but that there was actually a corresponding difference in the ability of the pupils in the different schools." The latter part of the study shows conclusively that

¹ The numeral used here to designate a school does not correspond with the numeral employed in the Milwaukee system but is part of a simplified system used throughout the study.

such was not the case. When the rank of the pupils in arithmetic was compared with their rank in algebra it was found that a greater percentage of School 14 (the school which gave the lowest marks) excelled in maintaining their original rank or increasing it. In fact there was a complete reversal of things from what the absolute marks alone might indicate. School 14 with a middle range 71-78 had 61 per cent of the pupils in algebra remaining in the relative position they had in the elementary school, while School 16 with a middle range 79-84 had 56 per cent remaining in their original rank, and School 7 with the highest middle range had the lowest retention—only 44 per cent.

HIGH-SCHOOL GRADES AND RANKS

The high-school rank which was used in these comparisons was determined in the following way. The distribution of marks for the whole class in the high school and divisions into tertiles was made just as with the elementary data. A pupil's rank in this case is his relative position among all of the Freshmen in his high school.

It is a good plan to transfer the high-school records of all pupils considered to individual cards which have spaces also for elementary marks and rank. And it is well for comparative purposes to have the data from one school placed on the right side of the card and that of the other school on the left. In this way subjects of natural sequence or close relationship can be placed in close juxtaposition. Thus arithmetic and algebra can be compared. Then the cards can be shuffled to arrange the material with reference to any problem that may come up. Most of the time the cards of pupils from each elementary school will be kept together in one group; sometimes the point of interest may require a grouping by high schools; or a separation of those failing may be needed in order to make a special study of them; or again, those irregular in other ways may be selected for special study.

The material in some form like this may soon be the starting-point of studies in correlation. The work involved in the preliminary steps of a study using existing material is necessitated by our failure in the past to recognize the value of continuous records.

One could take the cards from any school, if made according to the suggestion above, and by a careful examination get a good general impression of its correlation with the higher institution, or of any marked peculiarities of its pupils as a group. But there is need for a more concise definite and graphic tabulation of results, especially if a superintendent is to make close comparisons of schools.

All of the material for any correlation can easily and simply be represented "on the square," as shown in Tables II, III, and IV.

TABLE II
SCHOOL 18—ALGEBRA

	1st	2d	3d	Total
Arithmetic— 1st.....		/	/	(7)
2d.....	//	//		(4)
3d.....			//	(7)
Total.....	(7)	(8)	(3)	

TABLE III
SCHOOL 17—ALGEBRA

	1st	2d	3d	Total
Arithmetic— 1st.....			//	(16)
2d.....	//	///		(12)
3d.....	/	///		(10)
Total.....	(13)	(10)	(15)	

These show retention and fluctuations of rank in mathematics for pupils of three different schools of Milwaukee. Each individual is again, as in Table I, represented by a tally. The small square in which this tally is placed depends upon the pupil's rank in arithmetic and in algebra. His rank in the elementary subject

will determine in which horizontal column the tally will be placed, but at the same time the tally must have position in a vertical column. The vertical column shows the pupil's rank in the subsequent high-school subject. To illustrate, a rank of first in both is represented in the upper horizontal and first vertical column; a rank of second in the elementary and third in the high-school subject is denoted by a tally in the second horizontal and third vertical column.

With just a little practice one can see all of the significant features at a glance. It is evident that a diagonal line from the upper left to the lower right corner would pass through the three spaces which indicate that students hold in the high school the same

TABLE IV
SCHOOL 4—ALGEBRA

	1st	2d	3d	Total
Arithmetic— 1st.....		/		(10)
2d.....			//	(7)
3d.....		/	//	(3)
Total.....	(9)	(7)	(4)	

rank that they had in the elementary school. The three small squares below the imaginary diagonal show the gains in rank—from second to first; third to second; and from third to first. The corresponding squares above show losses in the reverse order.

School 4 is an example of a school that has good retention—only four have shifted from the rank obtained in the elementary school and no one has fluctuated more than one point. School 18, on the other hand, shows many gains in rank; while School 17 has a preponderance of losses.

The question of the kind of representation from each school is clearly set forth on this diagram. The group from School 18 is very representative of the original class. On the basis of their early work we could expect about seven pupils in the lowest tertile

in high school. School 4 has more pupils in this low tertile and yet had comparatively very few of their poor pupils enter high school (three out of forty-two). The people who are satisfied with knowing only what kind of marks each delegation made in high school can see at a glance whether the right or the left side of the square has the most tallies.

The foregoing correlations in single subjects may be compiled into a composite card upon which all the correlations in all subjects are recorded for a given school. The same card may be used to record the withdrawals from the school. The general plan devised for this larger "school card" is shown in Table V. It shows the correlation in the sequences, reading and English; language and English, arithmetic and algebra, reading and Latin, language and Latin, and in elementary arithmetic and commercial arithmetic. The first three are the more important in considering

SUMMARY SHOWING RETENTION AND GAINS AND LOSSES IN RANK

Subject	Same	G. 1.	L. 1.	G. 2	L. 2
Reading and English	11	5	8	0	0
Language and English	12	4	7	1	0
Mathematics	18	3	3	0	0
Language and Latin	5	0	3	0	1

only a single class because the number of individuals taking the electives such as Latin and commercial arithmetic is often small. (The last correlation mentioned above is omitted in the accompanying summary.)

Such a card in addition to accumulating all the data for a given school offers an excellent opportunity to compare retention in different subjects.

There are several well-marked cases of the same group of pupils showing better preparation in one study than in another although they have been taught by the same teacher. The reason for such a condition may be perfectly obvious in any given case. For instance, a school in a foreign section of the city would often have difficulty with English. But there are in any system teachers who slight some subject that they do not like or in which their preparation is weak. When it is shown definitely that her pupils

TABLE V
SCHOOL 20

	English			Algebra			Latin			Failures	
	1	2	3	1	2	3	1	2	3	1" Sem.	2" Sem.
Reading— 1.....							//	/	///	L.	
	//	//	/				/	/	/	E.	
3.....	//	//	///					/	L.E.	E.	
Arithmetic— 1.....										A.	
2.....											
						/					
3.....							//			A.A.	A.A.
Language— 1.....									///	/	L.
	/		//								
2.....									//		E.
3.....	/	//	//							L.E.	E.E.

differ materially in preparation in different subjects it will be much easier to remedy the situation.

The double column at the extreme right of Table V needs some explanation and deserves some comment. Initial letters are used to show each failure in a given subject. Their position indicates in which semester the failure was made and the original rank of the pupil making the failure. This last point is usually overlooked but is vitally important in a comparative study of the efficiency of schools. Let us take an illustration which shows the bearing of this information on the question of failures—or rather “judgment by failures.” One school in this study had six pupils fail in high-school mathematics. There is nothing alarming about that, some other schools had as many. But the tabulation shows that three of the pupils who failed came to high school with marks which indicated that they were the best of their elementary class; the other three came from the second or middle tertile. There were no failures from the lowest tertile because none of their poorest pupils had elected to go to high school. It is more to the discredit of a school to have six failures under those conditions than it would be to have six of its poorest pupils fail—pupils recognized as poor and labeled that way before they entered the higher institution. The illustration given is an extreme case, but there was an unwarranted number of failures from the higher tertiles of some schools. Such failures were rare in schools that were shown to be better in the point of retention.

The results found in any system by such a method of correlation as the one here outlined will show that there are differences between the different elementary schools. Whether the particular condition in any school is due to some cause inherent in the constituency of that school or to the plan of organization of the school and the quality of instruction given is a matter for further investigation. But as long as a deficiency in any respect is unknown or merely a matter of conjecture and not an established fact there is little hope for the betterment of that condition. Facts of the type above reported certainly have this importance, that they make clear to any principal in a wholly impersonal way the problems which he ought to face as a member of a school system.